REMARKS/ARGUMENTS

Firstly, with respect to the election of the species, it is noted that the Office Action does not acknowledge receipt of the Preliminary Amendment filed November 26, 2003, filed after issuance of the office Action. Accordingly, this response assumes that the Preliminary Amendment filed November 26, 2003 has not been entered, and in particular that claims 22-23 stand withdrawn in the application. Further comments on these claims are provided below.

With respect to the priority claim from the parent application 09/592950 the Examiner had noted that this application, as a divisional application, should set forth only that portion of the earlier disclosure which is germane to the invention as claimed in the divisional application. That earlier application and the description of the present application both contain a description of a method and apparatus for implementing their respective inventions. In terms of a specific description with reference to a preferred embodiment shown in the figures, the method and apparatus aspects are intimately entwined, and, as a practical matter, it is not possible to separate them. Accordingly, it is submitted that the entire specific description of the preferred embodiments is germane as it stands to the present invention. To the extent that there are any pure apparatus features, these features facilitate understanding of the method and show how the method may be implemented in practice. It is noted that the summary of the invention section on pages 4-7 of the specification was revised on filing to encompass only the method aspects of the present invention. Accordingly, it is submitted that no amendment is required in this respect.

With respect to the status of the parent application 09/592,950, this application remains pending although it has been allowed and the issue fee will be paid shortly. Accordingly, its status as recited on the first page of the present application is currently correct. The Examiner is also advised that there is another pending divisional application 10/084,442, filed February 28, 2002.

The Examiner's acknowledgement of the information disclosure statements is noted. With respect to the drawings, the Examiner noted, correctly, that the reference numerals 18, 27 were missing from Figure 1. Attached are formal

drawings showing a proposed amendment to include references 18 and 27. These drawings include legible reference numerals. No new matter has been added.

With respect to the status identifier for claims17-25 as filed 03/04/2002, the Examiner argued that this was incorrect, and more particular the Examiner suggested that claims 17-25 should be identified as "currently amended" rather that "new". Our interpretation of the new guidelines for identifying claims is that the identifier "new" was, indeed, correct at that time. Applicant confirms that it was and is the intention to have these claims present in the application.

Further, in accordance with our understanding of the new guidelines and MPEP, these claims are now indicated as "original" or "currently amended" as is the case.

With regard to the objection to the disclosure, a reference to Figure 3c is being introduced by way of amendment on page 7. With respect to the title, this is being amended to indicate that it relates to the method aspect of the invention.

Turning to the rejection of the claims under 35 USC 103, the Examiner had first reminded the applicant of the presumption that the claims were commonly owned and this is indeed the case.

The Examiner rejected claims 13-21 as being obvious under 35 USC 103(1) in view of Condit et al 6,416,891.

In the paragraph bridging pages 6 and 7 of the action, the Examiner provided a detailed analysis of why, in the Examiners opinion, Condit et al discloses many of the elements of the claimed invention. More particularly, the Examiner detailed those features of Condit et al relating to the operation of proton exchange membrane (PEM) fuel cells. Solely to simplify prosecution, no comment is provided on this analysis of Condit et al. However, this should not be taken an admission that the Examiners analysis of Condit et al is correct and that it does indeed disclose all the relevant aspects of PEM fuel cell operation. More specifically, it is noted that Condit et al is concerned with a PEM fuel cell in which fuel is supplied from a reformer. Necessarily, this means that the hydrogen stream generated in the reformer includes many other unwanted, contaminant gases. This has a significant impact on the design and configuration of such a fuel cell system, and as shown in the figures of Condit et al,

such a system can become quite complex and require numerous other additional components to make it workable. In contrast, the present invention is primarily intended for a PEM fuel cell using a hydrogen fuel source, without any reformer reforming a hydrocarbon source.

The Examiner then referred to figures 1 and 3 of Condit et al and argued that these show that the burner 122 supplies an exhaust stream 130 to the reformer 132 which further processes the fuel to be fed into the fuel cell. The Examiner referred to a passage bridging columns 12 and 13 of the reference for disclosing the possibility that "the burner 122 may be a catalytic burner that oxidizes any excess reducing fluids such as hydrogen....".

The Examiner then alleged that "even though the burner exhaust stream leaving the burner 122 might be combusted to be non-flammable, somehow, a certain degree of combustion incompleteness may occur in the burner so as to leave any unused or uncombusted fuel... in the burner exhaust...". There is nothing in Condit et al to suggest that this is the case or that this would be permitted to happen. More particularly, if there was any significant quantity of unburnt fuel left, this would be a highly dangerous condition that would be avoided. The exhaust from the burner is mixed with the oxidant stream, and to mix a hot, fuel containing exhaust stream with an oxidant stream would be avoided. As detailed in the present invention, where a catalytic burner is used to generate a heated, humidified gas stream, it is essential that the humidified gas stream is, to the greatest extent possible, a pure fuel stream or a pure oxidant stream.

What the Examiner has overlooked in the analysis of figures 1 and 3 and in the selected portions of the figures as reproduced in the Office Action, is that the fuel supplied to the burner 122 is not from the original fuel source. Rather, the fuel is exhausted at 20 from the anode 14 of the fuel cell. This exhaust can be recirculated through the line 92, or fed through line 136, a heat exchanger 134, and line 138 to the burner 122. Thus, this exhaust line will contain the gaseous fuel mixture supplied originally from the reformer 126 to the anode 14 of the fuel cell, which gaseous stream has been depleted of most of the hydrogen in the fuel cell in normal operation to leave just some usable fuel in the exhaust. The intention of the burner 122 is to consume part

of this fuel to improve the performance of the overall system. Oxidant to the burner 122 is supplied through the line 124 and passes through the heat exchanger 140, to absorb the heat from the burner exhaust, part of which can be diverted through this heat exchanger 140.

To distinguish from this proposal, a number of amendments have been made to the claims. Firstly, the claims have been clarified with respect to which parts of the fuel of the oxidant are taking part in the different elements of the method. Thus, claim 1 specifies that one part of the oxidant is supplied to the fuel cells, while another part is supplied to the catalytic reactor. In claim 1, it is simply specified that the fuel is supplied to the catalytic reactor; it is later specified in claim 26, that part of the fuel can be directed to the fuel cells and part of it supplied to the catalytic reactor. These two alternatives are clearly disclosed in figures 1 and 2 of the present invention, so that no new matter has been added.

Claim 13 has been further amended to specify that the fuel and the "other part of the oxidant" are supplied to the catalytic reactor "prior to supply thereof to the fuel cells". Thus, the method now clearly specifies that the fuel and oxidant from the fuel and oxidant sources are supplied directly to the catalytic reactor, and that the catalytic reactor does not receive any recycled fuel or oxidant, i.e. fuel or oxidant that has been exhausted from the fuel cells.

Such a technique is nowhere taught or suggested in Condit et al. Condit et al is concerned with a much more complex proposal, in which a reformer 126 is required to reform a hydrocarbon fuel to generate a hydrogen source. As shown, this requires numerous other additional components, including heat exchangers, a water shift reaction 146 and an oxidizer 148, to generate a suitable gas stream. The burner 122 in Condit et al is simply provided to try and improve the efficiency of the overall system and to make use of exhausted fuel from the fuel cells.

Note that in view of the many and different complex reactions taking place in the reformer and other elements of Condit et al, there is no necessity to address the humidification problem of the present invention. In the present invention, where pure fuel and oxidant streams are used, these streams will, initially, be very low in humidity, usually with zero humidity, so that humidification is necessary to ensure that they are

supplied to the fuel cell stack at a suitable humidity level. Condit et al nowhere teach nor suggest, and have no need to teach or suggest, humidification of the fuel stream upstream of the fuel cell. Rather the burner 122 is provided to oxidize any excess reducing fluids such as hydrogen (Column 13, line 7) remaining in the exhaust gas stream. There is no mention of the desirability of humidifying any gas stream, nor the fact that the burner 122 can be used to generate humidification. Indeed, the gas stream formed by burner 122 will be a mixture of numerous different gases, and it is submitted that flow from the burner 122 into the fuel gas stream would need to be kept at a reasonable level, to avoid diluting the fuel gas stream with gases which simply act as diluents and not fuel gas.

Accordingly, it is submitted that claim 13 as amended is allowable is allowable over the known art.

With respect to claims 14 – 15, the Examiner made reference to various object statements in Condit et al and also in the initial description of Figure 1 at column 7, lines 13-15. The object statements are vague and give no details of any structure or method. At most, they hint at transferring heat and mass leaving the power plant back into the power plant through a mass transfer medium. More particularly, there is no teaching or suggestion in Condit et al that the burner 122 can somehow be used to facilitate startup in cold conditions. This is understandable, since the burner 122 is fed with exhaust gas from the fuel cell, so that necessarily there is no exhaust gas until the fuel cell stack is operational.

In contrast, in the present invention, the catalytic reactor is provided with fresh, not exhaust, fuel gas. Accordingly, claim 14 provides that, on initial start up, this gas is provided only to the catalytic reactor to generate a flow of heated and humidified fuel, which can then be supplied to the fuel cells. In the arrangement of Condit et al, where the burner is supplied with exhaust gas, this is simply not possible. Accordingly, it is submitted that claims 14 and 15 are clearly allowable.

With respect to claim 18, while Condit et al may indeed disclose the use of "conduits" for supply of the gas streams to various elements of the disclosed system, this teaches nothing about the shape of the individual elements. Clearly circular conduits are well known and conventional, and in almost all instances, are used to

connect elements or components that themselves have a wide variety of shapes, none of which are circular. It is therefore submitted that claim 18 has not been disclosed in this reference.

With respect to claim 19, the Examiner makes reference to the fuel cell being "surrounded by an electrically insulating frame structure that defines manifolds for directing the flow reducing, oxidant, coolant and product fluids...". This may well be the case. It is not seen how this has any relevance to the provision of check valves to prevent back flow of oxidant fuel as claims in claim 19.

Similarly, with respect to claim 20, it is not seen how the features allegedly disclosed in Condit et al have any relevance to the flash arrester as specified in claim 20.

With respect to claim 21, the Examiner argued that Condit et al use a fluid delivery device such as coolant and fuel pumps. It is submitted that the structure disclosed in Condit et al is not identical to the present invention and that in any event, claim 21 is allowable as being dependent from an allowable claim. As indicated above, in view of the fact that an earlier Preliminary Amendment has not been entered, claims 22-25 have been retained, but indicated as being withdrawn. In view of the possibility that it may be possible to retain these claims in the present application, the opportunity has been taken to amend the claims, to take into account the amendments made to the earlier claims. It is submitted that these claims 22-25 as amended are allowable, and can properly be retained in the present application as relating to the same invention as the other claims.

The opportunity has been taken to introduce a new claim 26 to make it clear that part of the fuel may be supplied to the catalytic reactor and part of it may bypass the catalytic reactor, corresponding to the arrangement shown in Figure 2. Similarly, to cover the case where it is desired to humidify the oxidant stream, a similar arrangement is specified in claim 27, again corresponding to the structure in Figure 3.

Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

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By _____

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Attachments

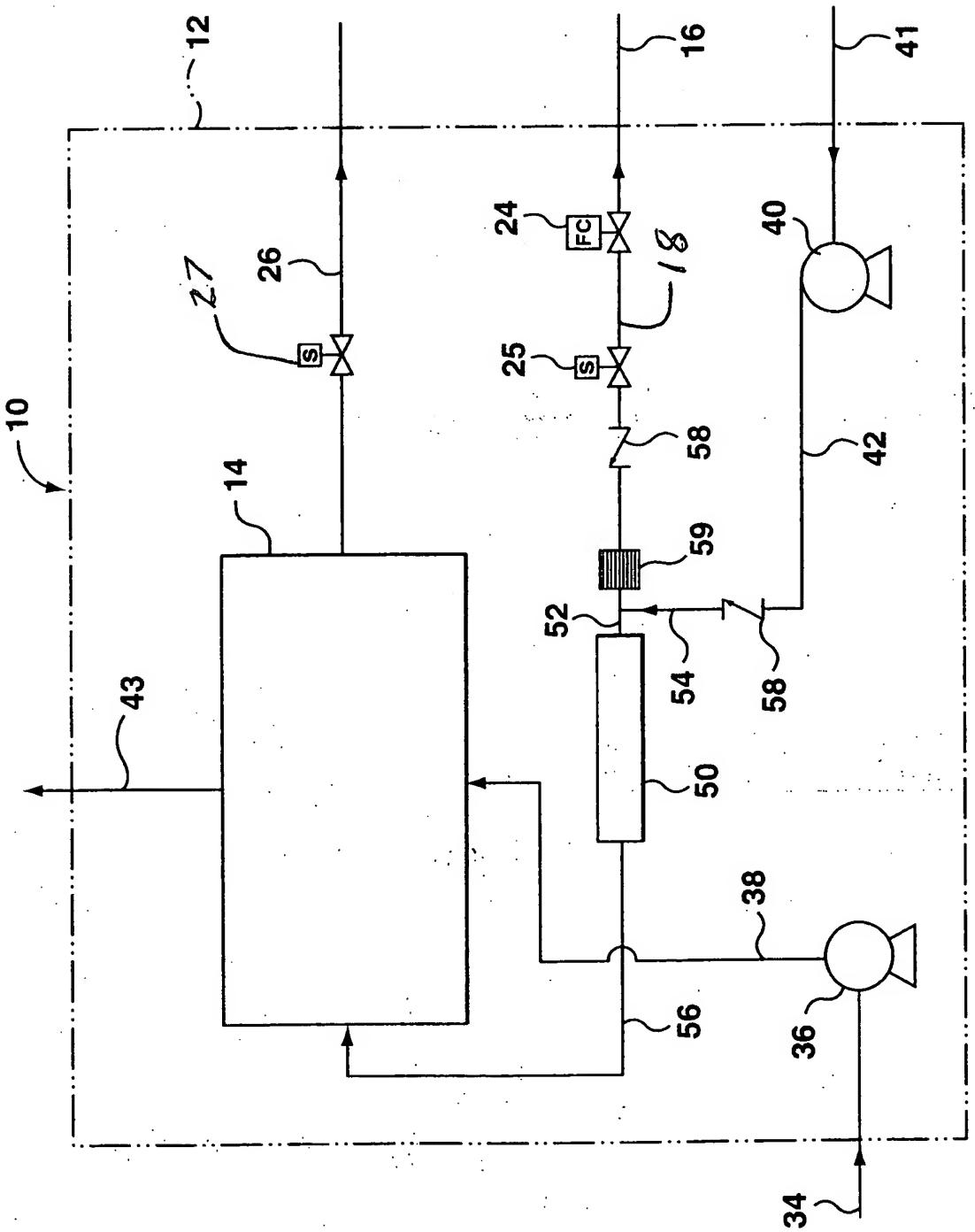

FIG. 1